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Factsheet

Pest Management Program for Grape Series

GRAPE BERRY MOTH

(Revision of Factsheet "Grape Berry Moth on the Niagara Peninsula", April 1982)

Kevin W. Ker, Pest Management Advisor, Vineland Station

HISTORY

The grape berry moth (GBM), *Endopiza viteana* (Clemens), is present almost everywhere that cultivated or wild grapes and grown (Figure 1). It was first recognized in the Niagara Peninsula in 1917 when, according to reports, "it was not seen in sufficiently large numbers to justify adoption of remedial measures". However, by 1923, infestations of this pest in a few vineyards were such that 90 to 100% of the crop was left uncut. Since that time, sporadic outbreaks causing serious losses have occurred throughout Niagara. At present, the grape berry moth is the most damaging of insect pests attacking grapes. Observations over the past several years indicate that up to 3 generations of active, feeding larvae occur each year.

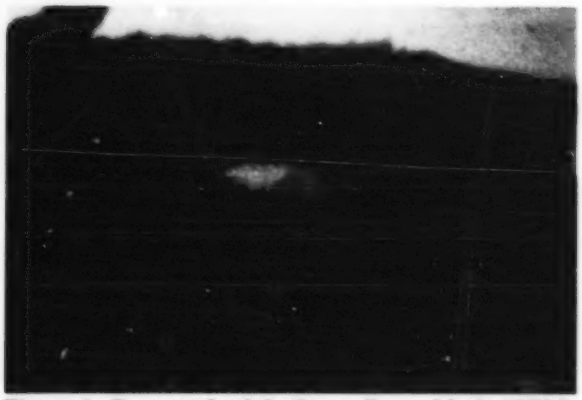

Figure 1. Pupa and adult Grape Berry Moth (GBM)

BIOLOGY

Grape berry moth overwinters as pupa in a cocoon encased in a section of leaf. The pupa is very light and easily moved by wind from its original location below grapevines to low lying or well protected areas of ditches, headlands, etc.

In early spring, the adult moth's first emergence often corresponds with bud break. Mating occurs during late afternoon into dusk when temperatures exceed 13°C. Female GBM begin laying eggs shortly afterwards with peak activity in late afternoon until dusk.

The development from egg to first instar larvae can vary from 5 days (25°C) to 15 days (15°C). There are 5 larval instars or stages that GBM passes through before pupating and emerging as an adult moth. It is the five larval instars that cause the physical injury to the grape clusters, berries and leaves. Adults GBM do not feed or cause any damage.

Depending on weather conditions there may be 2 to 3 generations of GBM each growing season.

FIRST GENERATION ACTIVITY

Adult moths first emerge in early May with egg deposition beginning in late May – early June and continuing for a few weeks. Egg laying coincides with the first visual presence of the fruit clusters (prior to bloom) on the vine. The eggs are laid singly among the flower clusters, on petals, fruit stems and newly developing berries (Figure 2). Within 4 to 8 days, small greenish larvae begin feeding on the clusters leaving fine silken webs as they move about (Figure 3).

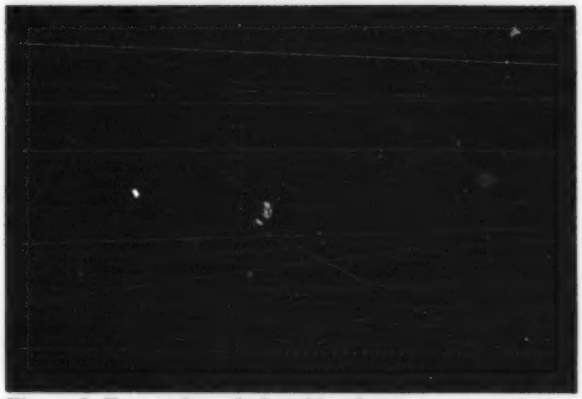

Figure 2. Egg and newly hatching larva on grape cluster floret.

The larvae may consume many individual florets and make a small web. If numerous larvae are present, the webbing can become very dense encasing blossoms, stems and entire sections of fruit clusters. Many of the berries damaged at this time will wither or drop to the ground when they reach pea size.

Figure 3. Young larva feeding and leaving silken web trail

Larval development is completed in about 3 to 4 weeks from egg hatch. The mature larva seeks foliage on which to pupate. Within a small semi-circular flap of the leaf (Figure 4), the larva spins a silken cocoon. Adult emergence occurs 2 to 4 weeks after pupation.

Figure 4. GBM larva pupating within semi-circular flap of leaf

SECOND GENERATION

In late June through July, the next generation of adult GBM appear with mating and oviposition occurring around dusk. Females deposit cream coloured eggs on the berries shortly after mating with most larva appearing in 5 to 7 days later.

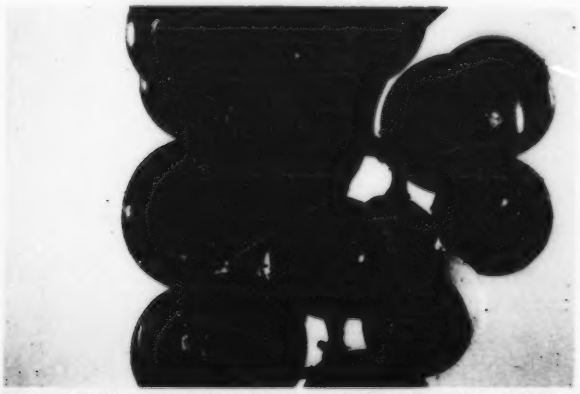

Figure 5. Numerous berries wounded by feeding of GBM larva

Larva of this generation feed exclusively on the developing berries. A larva eats a small hole in the side of a berry and tunnels inside to feed below the skin surface. Infested berries are distinguished by small purplish spots that may cause the fruit to crack or shrivel. Wound sites are ideal for the entry of other insects or diseases (Figure 5).

A larva may complete its development in a single fruit but usually it moves among many berries in a cluster causing greater crop loss. Some berries may drop, shrivel or dry up, depending on the extent of the larval feeding.

By late July, larvae of this generation have finished development and exit the fruit cluster to find a suitable location to pupate (similar to that of the first generation). Some pupae of this generation may remain dormant until the following spring.

THIRD GENERATION

Adult GBM begin appearing in early August and continue to emerge throughout August into September. Egg deposition continues over a prolonged period of time and larval activity can extend until late September - October when first frost occurs.

These larvae cause the greatest amount of noticeable injury at harvest and often wound rapidly maturing clusters making them very susceptible to disease infection (Figure 6), especially by Botrytis bunch rot (see OMAF Factsheet, *Botrytis Bunch Rot of Grapes,* Agdex 231 / 634).

Because of the extended emergence of adults and subsequent egg deposition, there can be a great range of larval instars present at harvest. Research indicates that late stage larvae often drop to the ground to pupate instead of pupating in a leaf on the vine. This may account for the wide dispersal of overwintering pupae and the observation of GBM in leaves other than grape (i.e. golden rod, lambs quarters, etc.).

Figure 6. Secondary injury by *Botrytis cinerea* after damage by GBM

CONTROL STRATEGIES

Within the Niagara Peninsula, population levels vary, not only from region to region, but also vineyard to vineyard within regions. Many growers have noticed areas in vineyards that annually have greater damage from GBM than in other areas of the same vineyard.

These "hot spots" are usually around the periphery of the vineyard and often adjacent to wooded areas. The wooded areas likely provide greater protection for overwintering pupae and may harbour wild grapevines that can serve an alternate host for GBM. These wild hosts may also harbour other pests that can affect commercial vineyards.

Overwintering mortality of GBM can be influenced by the action of earthworms and feeding of ground beetles along with low winter temperatures, especially in the absence of snow. Parasitism is not a significant factor in GBM control.

CULTURAL PRACTICES

Removal of alternate hosts nearby the vineyard can reduce GBM migration. Within the vineyard, rototilling or cultivating in early spring will bury the previous season's leaves and prevent moths from emerging. This tactic can reduce the number of spring emerging moths resident in the vineyard. Keeping records of injury levels in specific regions in the vineyard or on specific cultivars can assist the grower in determining remedial control measures. There has been some research done into the use of mating disruption techniques with pheromones. At this time the results have not been satisfactory under Ontario conditions and cannot be widely recommended commercially.

CHEMICAL METHODS

In Ontario, the most effective method for controlling GBM involves the proper application of a well-timed insecticide. Insecticides recommended for GBM control are reviewed annually in OMAF Publication 360, *Fruit Production Recommendations.*

Pest monitoring programs for GBM are operated in the grape growing regions of Ontario utilizing synthetic sex pheromones and selective sampling throughout the growing season (Figure 7). Accurate dates for effective pesticide applications can be obtained from agriphone messages available in the grape districts.

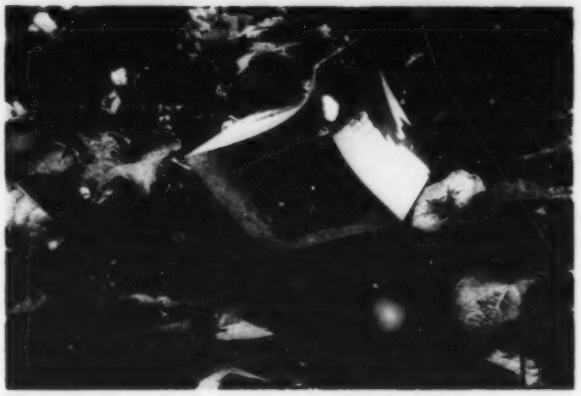

Figure 7. Pheromone traps used in Grape IPM to monitor adult male GBM activity

For effective insecticide use, timing of sprays coincides with egg hatch and young larval activity. To be effective, the material must be applied in a manner that will leave a good deposit on the foliage and fruit clusters. As the season progresses, higher volumes of water may be needed because of the greater difficulty in penetrating the increased foliage and vine growth. Where the spray machine is not capable of applying high volumes of water, modifications to improve spray coverage (the use of hooded booms, directing the spray airstream into the row instead of across, etc.) may be necessary.

It is important that the grower regularly check the vineyard for GBM activity (at least weekly from early July to harvest) and apply corrective measures of more than 5% if the clusters are injured. If this damage appears confined to the edge of the vineyard, a border treatment with an insecticide may be sufficient.

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